

What is claimed is:

1. A Carrier Network for providing communication between multiple users and a Service Provider, comprising:

- (a) computer network equipment defining an Intermediate Network and a shared communications medium, said Intermediate Network and said shared communications medium extending between the users and the Service Provider for conveying data therebetween, said shared communications medium joining the users with said Intermediate Network such that data of each user is conveyed over said shared communications medium to and from the Intermediate Network whereby the users compete for network access; and

- (b) software for managing network access of the users across said shared communications medium, said software including computer-executable instructions that performs the steps of:

- (i) monitoring the network access usage by each user for a time interval; and

- (ii) based on the monitored network access usage, setting a network access allowance for each user representing a level of network access made available for utilization by the user during a future time interval, but not necessarily representing the level of network access that will be utilized by such user during the future time interval.

2. The Carrier Network of claim 1, wherein said network equipment further defines a Cable Network and said shared communications medium comprises a coaxial cable of said Cable Network.

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3. The Carrier Network of claim 2, wherein said software comprises software modules distributed within computer readable media of said network equipment.
4. The Carrier Network of claim 2, wherein said software comprises software modules stored in a computer readable medium of a hardware component.
5. The Carrier Network of claim 4, wherein said hardware component is physically located with said network equipment.
6. The Carrier Network of claim 5, wherein said Carrier Network comprises a Data-Over-Cable (DOC) Network and said hardware component is located within a regional data center of said DOC Network.
7. The Carrier Network of claim 5, wherein said Carrier Network comprises a Data-Over-Cable (DOC) Network and said hardware component is located within a headend of said DOC Network.
8. The Carrier Network of claim 4, wherein said hardware component is physically located remotely from said network equipment.
9. The Carrier Network of claim 8, wherein said hardware component is directly connected with said network equipment for communication therebetween.
10. The Carrier Network of claim 8, wherein said hardware component is indirectly connected with said network equipment through the Internet for communication therebetween.
11. The Carrier Network of claim 2, wherein said software modules include:
 - (i) a first software component that manages a database for storage and retrieval of data;
 - (ii) a second software component that collects data representative of network access usage from said network equipment, and that sends data

representative of network access usage to said first component for storage thereof; and

(iii) a third component that retrieves data representative of network access usage stored in said first component and sets, based at least partially thereon, network access allowances for the users for the future time interval.

12. The Carrier Network of claim 11, further includes a fourth component having a graphical user interface for sending data to said first component for storage and for retrieval of data stored by said first component.

10 13. The Carrier Network of claim 1, wherein network access comprises bandwidth across the shared communications medium for consumption by each user in conveying data of the user.

14. The Carrier Network of claim 13, wherein the step of monitoring comprises monitoring bandwidth that is consumed by each user in an upstream direction across said shared communications medium in time intervals of one minute to fifteen minutes.

15 15. The Carrier Network of claim 13, wherein the step of monitoring comprises monitoring bandwidth that is consumed by each user in the downstream direction across said shared communications medium in time intervals of fifteen minutes to sixty minutes.

20 16. The Carrier Network of claim 1, wherein the time interval for which network access usage is monitored and the future time interval are equal in length.

25 17. The Carrier Network of claim 1, wherein the time interval for which network access usage is monitored and the future time interval each is approximately one minute to sixty minutes in length.

18. The Carrier Network of claim 1, wherein the step of monitoring network access usage includes collecting data representative of the number of logical data units transmitted from and to each user during a time interval.
19. The Carrier Network of claim 1, wherein the step of monitoring network access usage includes collecting data representative of the number of bytes and data packets transmitted from and to each user during a time interval.
20. The Carrier Network of claim 1, wherein the step of monitoring network access usage includes collecting data representative of the number of logical data units of the user that are dropped during a time interval.
21. The Carrier Network of claim 1, wherein the step of monitoring network access usage includes collecting data representative of the number of bytes and data packets of the user that are dropped during a time interval.
22. The Carrier Network of claim 1, wherein the step of monitoring network access usage includes collecting data representative of the number of logical data units of the user that are requested to be transmitted in an upstream direction across said shared communications medium during a time interval.
23. The Carrier Network of claim 1, wherein said step of setting a network access allowance for each user comprises allocating network access equally to the users and setting the network access allowance for each user equal to that user's allocated network access.
24. The Carrier Network of claim 23, wherein said software further includes computer-executable instructions that perform the additional step of prioritizing the users for allocating network access.
25. The Carrier Network of claim 24, wherein the prioritizing is based on fairness considerations.

26. The Carrier Network of claim 25, wherein the users are prioritized based on user throughput during a time interval, with a user with lesser throughput rate receiving priority over a user with greater throughput rate.
27. The Carrier Network of claim 25, wherein the users are prioritized based on data
5 loss for each user during a time interval, with a user with greater data loss rate having priority over a user with lesser data loss rate.
28. The Carrier Network of claim 25, wherein the users are prioritized based on network access usage for a particular time of day, with a user with lesser network access usage for the particular time of day receiving priority over a user
10 with greater network access usage for the particular time of day.
29. The Carrier Network of claim 25, wherein the users are prioritized based on both user throughput and data loss of the user during a time interval.
30. The Carrier Network of claim 25, wherein users are prioritized based on an established minimum quality of service (QoS) standard.
- 15 31. The Carrier Network of claim 24, wherein prioritizing is based on service level agreements (SLAs) of the users regarding the provision of network access.
32. The Carrier Network of claim 31, wherein SLAs specify respective minimum levels of network access for users, and prioritizing includes comparing each user's monitored network access usage with the specified respective minimum levels of
20 network access, and awarding priority to a user when said respective monitored network access usage for such user falls below the user's specified respective minimum level of network access.
33. The Carrier Network of claim 31, wherein SLAs specify respective time-of-day (TOD) minimum levels of network access for users, and prioritizing includes
25 comparing the monitored network access usages for such users during the

specified respective TOD with the specified respective TOD minimum levels of network access, and awarding priority to a user when the monitored network access usage during the specified respective TOD for such user falls below the user's specified respective TOD minimum level of network access.

5 34. The Carrier Network of claim 31, wherein SLAs specify respective minimum levels of network access up to a maximum burstable levels with target probability for users, and prioritizing includes comparing the monitored network access usage both with the respective minimum levels of network access for such users and with the respective maximum burstable levels of network access for such users, and comparing the instances the respective maximum levels of network access were obtained for such users out of all instances the respective maximum levels of network access were requested for such users.

10 35. The Carrier Network of claim 31, wherein SLAs provide respective fees for network access usage, and prioritizing comprises sorting such users based on each user's respective fee in decreasing order, with a user with a higher fee receiving priority over a user with a lesser fee.

15 36. The Carrier Network of claim 31, wherein SLAs provide respective credits for levels of network access below respective guaranteed levels for users, and prioritizing comprises sorting such users based on each user's respective credit in decreasing order, with a user with a higher credit receiving priority over a user with a lower credit.

20 37. The Carrier Network of claim 31, wherein SLAs specify respective minimum levels of network access for users, and allocating network access comprises allocating network access to such users equal to each user's specified respective minimum level of network access.

38. The Carrier Network of claim 1, wherein said software further includes computer-executable instructions that perform the step of forecasting network access usage by each user during the future time interval based on the monitoring of network access usage by each user.

5 39. The Carrier Network of claim 38, wherein forecasting comprises predicting future network access usage of each user based upon monitored past network access usage patterns of each user.

40. The Carrier Network of claim 38, wherein forecasting comprises applying an adaptive-response-rate single exponential smoothing function and a Holt-Winters' seasonal exponential smoothing function to the monitored network access usages of the users.

41. The Carrier Network of claim 38, wherein said step of setting a network access allowance for each user comprises allocating network access to users proportional to each user's forecasted network access usage.

15 42. The Carrier Network of claim 38, wherein said step of setting a network access allowance for each user comprises allocating network access, and wherein said software further includes computer-executable instructions that perform the step of prioritizing the users for allocating network access.

43. The Carrier Network of claim 42, wherein prioritizing is based on each user's forecasted network access usage.

20 44. The Carrier Network of claim 42, wherein said users are prioritized in increasing order of each user's forecasted network access usage, with a user with a lesser forecasted network access usage receiving priority over a user with a greater forecasted network access usage.

45. The Carrier Network of claim 38, wherein said step of setting a network access allowance for each user comprises allocating network access to the users equal to each user's forecasted network access usage, and then allocating any remaining network access equally to the users.

5 46. The Carrier Network of claim 38, wherein said step of setting a network access allowance for each user comprises allocating network access to the users equal to each user's forecasted network access usage, and then allocating any remaining network access to the users proportionally based on each user's forecasted network access usage.

10 47. A computer-readable medium having computer-executable instructions that manage network access across a shared communications medium between competing users of a Carrier Network, said instructions performing the steps of:

- 15 (a) monitoring the network access usage by each user for a time interval; and
(b) setting a network access allowance for each user representing a level of network access made available for utilization by the user during a future time interval, but not necessarily representing the level of network access that will be utilized by such user during the future time interval.

48. The computer-readable medium of claim 47, wherein said step of setting a network access allowance for each user comprises allocating network access, and
20 wherein said software further includes computer-executable instructions performing the step of prioritizing the users for allocating network access.

49. The computer-readable medium of claim 48, wherein the prioritizing is based on fairness considerations.

50. The computer-readable medium of claim 48, wherein the users are prioritized based on user throughput during a time interval, with a user with lesser throughput rate receiving priority over a user with greater throughput rate.
51. The computer-readable medium of claim 48, wherein the users are prioritized based on data loss for each user during a time interval, with a user with greater data loss rate having priority over a user with lesser data loss rate.
52. The computer-readable medium of claim 48, wherein the users are prioritized based on network access usage for a particular time of day, with a user with lesser network access usage for the particular time of day receiving priority over a user with greater network access usage for the particular time of day.
53. The computer-readable medium of claim 48, wherein the users are prioritized based on both user throughput and data loss of the user during a time interval.
54. The computer-readable medium of claim 48, wherein users are prioritized based on an established minimum quality of service (QoS) standard.
55. The computer-readable medium of claim 48, wherein prioritizing is based on service level agreements (SLAs) of the users regarding the provision of network access.
56. The computer-readable medium of claim 55, wherein SLAs specify respective minimum levels of network access for users, and prioritizing includes comparing the monitored network access usages for the users with the specified respective minimum levels of network access, and awarding priority to a user when the respective monitored network access usage for such user falls below the user's specified respective minimum level of network access.
57. The computer-readable medium of claim 55, wherein SLAs specify respective time-of-day (TOD) minimum levels of network access for users, and prioritizing

includes comparing the monitored network access usages for such users during the specified respective TOD with the specified respective TOD minimum levels of network access, and awarding priority to a user when the monitored network access usage during the specified respective TOD for such user falls below the user's specified respective TOD minimum level of network access.

58. The computer-readable medium of claim 55, wherein SLAs specify respective minimum levels of network access up to a maximum burstable levels with target probability for users, and prioritizing includes comparing the monitored network access usage both with the respective minimum levels of network access for such users and with the respective maximum burstable levels of network access for such users, and comparing the instances the respective maximum levels of network access were obtained for such users out of all instances the respective maximum levels of network access were requested for such users.

59. The computer-readable medium of claim 55, wherein SLAs provide a respective fee for network access usage, and prioritizing comprises sorting such users based on each user's respective fee in decreasing order, with a user with a higher fee receiving priority over a user with a lesser fee.

60. The computer-readable medium of claim 55, wherein SLAs provide respective credits for levels of network access below respective guaranteed levels for users, and prioritizing comprises sorting such users based on each user's respective credit in decreasing order, with a user with a higher credit receiving priority over a user with a lower credit.

61. The computer-readable medium of claim 55, wherein SLAs specify respective minimum levels of network access for users, and allocating network access

comprises allocating network access to such users equal to each user's specified respective minimum level of network access.

62. The computer-readable medium of claim 55, further comprising computer-executable instructions performing the step of forecasting network access usage by each user during the future time interval based the monitoring of network access usage by each user.

63. The computer-readable medium of claim 62, wherein forecasting comprises predicting future network access usage of each user based upon monitored past network access usage patterns of each user.

64. The computer-readable medium of claim 62, wherein forecasting comprises applying an adaptive-response-rate single exponential smoothing function and a Holt-Winters' seasonal exponential smoothing function to the monitored network access usages of the users.

65. The computer-readable medium of claim 62, wherein allocating network access comprises allocating network access to users proportional to each user's forecasted network access usage.

66. The computer-readable medium of claim 62, further comprising computer-executable instructions performing the step of prioritizing the users for allocating network access.

67. The computer-readable medium of claim 66, wherein prioritizing is based on each user's forecasted network access usage.

68. The computer-readable medium of claim 66, wherein said users are prioritized in increasing order of each user's forecasted network access usage, with a user with a lesser forecasted network access usage receiving priority over a user with a greater forecasted network access usage.

69. The computer-readable medium of claim 62, wherein allocating network access comprises allocating network access to the users equal to each user's forecasted network access usage, and then allocating any remaining network access equally to the users.

5 70. The computer-readable medium of claim 62, wherein allocating network access comprises allocating network access to the users equal to each user's forecasted network access usage, and then allocating any remaining network access to the users proportionally based on each user's forecasted network access usage.